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eight days preceding the aurora was 22.6 millimeters on my record; while for the five days after the record became measurable the mean diurnal variation was 17.7 millimeters.

During the entire month of June the electric records were more than usually disturbed. Early in July the disturbance increased. On July 6, 7 and 8 the disturbances were the greatest that have been observed since August 1, 1920. On the morning of July 10 an aurora was reported as visible in northern California. From that time to the present (July 19) the records have been very little disturbed and the range of variation has been much smaller than the average for the year.

FERNANDO SANFORD

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THE AMERICAN CHEMICAL SOCIETY.

(Continued)

*Increasing the yield of our dyes:* J. L. BULLOCK. The first consideration is a thorough knowledge of the intermediates. Tests for quality are essential as small amounts of impurity have a decided effect on the yield. Specialization on few dyes is necessary in order to know them thoroughly. The best intermediates obtainable are usually the cheapest in that they give greatly increased yields. The sedimentation of solutions is advantageous and filtration at every stage adds to tinctorial power of the subsequent dye. In actual synthesis of dyes, intelligent use of equipment is as essential as chemical control. Uniformity in carrying out reactions is a great factor in obtaining maximum yields. Diazotizations should be as rapid as possible. Coupling a difficult condensation; the foam a good indication of its course. It is important to precipitate the dye in an easily filterable state. With triphenylmethane dyes even greater care must be used than with the azo dyes. A knowledge of the dyeing properties, fastness, etc., is very useful in getting the standard of purity to the highest possible point. Attention to the most minute details is repaid by increased tinctorial power and lessened cost of the finished dye.

*The preparation in the pure state of certain dyes of the malachite green series:* WALTER A. JACOBS AND MICHAEL HEIDELBERGER. It is shown that in many cases in which the chlorides are too soluble or do not crystallize, the nitrates may advantageously be used for isolation of the dyes. Descriptions are given on this basis of salts of malachite green and some of its methyl, halogen, amino, acylamino,

alkylamino, hydroxy, and alkoxy derivatives, as well as the nitrate of brilliant green, and the furfural analog of malachite green.

*The electrometric titration of azo dyes:* D. O. JONES. The titanous chloride reduction methods originally suggested by Knecht for the analysis of numerous compounds, both organic and inorganic, have, in recent years, come into more general use in the field of dye chemistry. The titanous chloride method for the analysis of azo dyes becomes more generally applicable, when the end point of the titration is determined by the electrometric method. The method in general is similar to the usual oxidimetric analysis as carried out with the electrometric apparatus. In the former methods, employing the use of a sulphocyanide indicator, the end point in the back titration with ferric alum is sometimes difficult to determine. Dark colored material in suspension and the color which is sometimes imparted to the solution by the products of reduction do not interfere in the electrometric method. It also permits the use of larger samples, while the end point is readily and accurately obtained.

*Extraction process of wool degreasing:* LOUIS A. OLNEY. A thorough study of the subject of wool cleansing is quite sure to lead to the conclusion that the extraction method, i.e., the treatment of the raw wool under proper conditions with certain organic solvents, is far more scientific in principle than the ordinary emulsive process. With efficient apparatus and good management the expense of cleansing wool is reduced to a minimum by this process and the results obtained approach the maximum established through theoretical and economical considerations. Although the early attempts to degrease wool by the use of volatile solvents resulted in complete failure, many practical incentives sufficed to keep interest in the process alive.

*Fastness to storage:* OSCAR R. FLYNN. Dyed cotton goods sometimes changes unevenly when stored in the folded piece. Regions of change mark out the channels along which air flows due to changes in temperature. This shows that the change in the dye is caused by some substance present in the air in small quantity and not primarily to oxidation, which shows its effect in the interior of a mass of goods. In some cases the change is temporary, and the result of the action of acid alone. In other cases the effect is due in the first place to acid, but followed later by complete destruction of the dye. Alkali sensitive dyes such as Stilbene Yellow show temporary changes due to acid alone. Acid sensitive dyes, such as

Congo Red, show permanent change due to fading after actions of acid. When alkalis are used in finishing, enough should be used to last a year or more. Alkali sensitive dyes should be finished in the acid condition. Dyes fast to acid and alkali are safest.

*Relation of chemical structure to dyeing properties:* WARREN N. WATSON.

*Special cost features and their relation to the development of our organic chemical industry:* GASTON DUBOIS.

*The effect of dye structure on dye adsorption:* LEON W. PARSONS AND W. A. MCKIM. Some preliminary results which were obtained during the course of an extended investigation now being conducted on the relation between the structure of dyes and their adsorption constants are discussed. Data have been obtained regarding the constants of adsorption in the case of the following water-soluble dyes when equilibrated with wool at constant temperature—picric acid, eosin, erythrosine, brilliant green, malachite green, ponceau 2G, ponceau 4GB, chromotrope 2R, and chromotrope 2B. In all cases, the equilibrium points obtained are found to be well represented by the Freundlich adsorption equation. A close similarity in structure between dyes within a certain chromophoric classification gives practically the same value for  $1/n$ , one of the Freundlich constants, whereas a wider difference in structure is accompanied by a corresponding tendency toward divergence in the value of  $1/n$ . Some interesting results have been obtained regarding the effect on adsorption of loading the pure dyes with various amounts of sodium sulfate.

*Is an export trade necessary to the dye industry?:* J. MERRITT MATTHEWS.

*Preparation of amino-phenol-sulfonic acid by the chloro-benzene method:* JOSEPH R. MINEVITCH. Amino-phenol-sulfonic acid (2: 1: 4) is best prepared by reducing the corresponding nitro-phenol-sulfonic acid with either acid or alkali reducing agents, depending upon the medium in which the nitro body is last obtained. A successful manufacturing process would, therefore, largely be based upon the ease with and small cost at which the nitro compound can be produced in large quantities. There are four other possible methods for its manufacture but the chloro-benzene process gives the highest yield and at a vastly cheaper cost. The paper will consist of a discussion of experimental results and will give directions for preparation.

*The future of research in the dye industry:* M. L. CROSSLEY. Research is of vital importance to the dye industry. Men must be carefully selected and thoroughly trained. It is of the utmost importance that only those giving promise of research ability and possessing the capacity for the development of the spirit of research should be selected. To depend upon "the law of the survival of the fittest" to eliminate the unfit is economically wasteful and dangerous. A grave responsibility rests upon our educational institutions for the selection and training of men to direct and carry on the future activities of our industries. The training for research must be thorough. Herein, our system of education is weak. There must be greater appreciation of the contribution of research to the progress of industry before research will be correctly evaluated. The compensation of the research man must be commensurate with his service to the industry, if the best men are to be encouraged to serve in this field. The future of the dye industry in this country will depend upon our ability to develop able research men and upon our willingness to adequately appreciate the contribution of research to the progress of the industry.

*The qualitative and quantitative evaluation of dyestuffs:* ROBERT E. ROSE. Determining the value of dyestuffs is an art as complex as that of the gem expert. The dye tester must compare different colors so closely that he is able to tell the difference produced by 1/32 of an ounce of color in 1000 lbs. of material. He must do this on a little sample, weighing 1/14 to 1/3 oz., that is, he actually sees the difference produced by adding or subtracting 1/10,000,000 of an ounce of the dyestuff in the field of vision. In the matter of shade he must check one lot of dye against another and not pass any two that vary perceptibly to the ordinary eye. If he is asked to do so, he must be ready to match colors just as exactly.

*A method for the use of metal sensitive chrome colors in iron machines:* FRANCIS C. TELEN.

*The present status of the domestic coal-tar product industry:* C. R. DE LONG.

#### DIVISION OF WATER, SEWAGE AND SANITATION

W. P. Mason, Chairman

W. W. Skinner, Secretary

*Investigations of the chemical reactions in water purification, using the hydrogen electrode:* A. M. BUSWELL. Titration curves with carbonates of sodium, magnesium and calcium, using a strong acid, show that the shape and position of the curve is

unaffected by the metal ion, but that the inflection point occurs at a slightly lower hydrogen-ion concentration in dilute solutions than in the more concentrated ones. Precipitation curves of the precipitation of calcium as the carbonate while not as regular as those obtained in the precipitation of magnesium, tend to show that the reaction is complete, sufficient carbonate being present, at a hydrogen-ion concentration corresponding to pH of 9.5.

*Study of the Weszelszky method for the determination of iodide and bromide:* W. E. SHAFFER AND J. W. SALE. The Weszelszky method has been carefully tested. The kind and quantity of absorbing alkali and the time and temperature used to remove the chlorate were varied until satisfactory conditions for the recovery of bromine from bromine water were found. A modified absorption apparatus was constructed and the kind and concentration of the acid added to the reaction flask varied in an effort to recover bromine quantitatively from potassium bromide and estimate it by the method found to be satisfactory. Iodine was converted into iodic acid by chlorine water in the reaction flask and estimated in solutions of various acid concentrations. A rapid and satisfactory modified Weszelszky method for the determination of small amounts of iodine based on these experiments is given. The Weszelszky method for bromide in the presence of iodide, however modified, is incapable of giving satisfactory results on small samples and its use is not recommended.

*Purity of bottled mineral waters:* W. W. SKINNER AND J. W. SALE. During the past year, the Water and Beverage Laboratory of the Bureau of Chemistry has made sanitary inspections of about seventy-five springs and wells, located in ten states. These inspectors uncovered numerous unsuspected sources of pollution of which specific examples are described. Samples of water from interstate shipments and from shipments offered for entry into the U. S. are also analyzed for their purity. In the last six years over 4,000 bottles were opened and the water examined. Shipments of polluted water are either refused entry in the case of foreign waters or are condensed and destroyed in the case of domestic waters.

*Commercial peptones and the culture media used in the examination of water:* E. M. CHAMOT AND F. R. GEORGIA. Titration curves of the following peptones are shown: Witte; Bacto (Digestive Ferments Company); Proteose (Digestive Ferments Company); Armour's; Parke, Davis Company; Fairchild Brothers and Foster; and Stearns. The

peptones are grouped according to relations shown by these curves. The optimum reaction ( $P_H$ ) using a culture of *B. coli* is given for each peptone. This is determined by attenuating the culture by exposure to a suitable dilution of phenol and inoculating a series of tubes containing the peptone solution adjusted to various  $P_H$  values at definite time intervals and noting the  $P_H$  value in which growth is obtained after exposure of the culture to the phenol for the longest period of time. It is shown that Witte, Bacto, Proteose, Armour's, and Parke, Davis and Company Peptones give optimum growth when unadjusted or but very slightly adjusted. With Fairchild Brothers and Foster's and Stearns's peptones it is necessary to adjust the reaction to a  $P_H$  value slightly above 5.7. It is shown that the optimum  $P_H$  value for *B. coli* in peptone KCl solution varies over a considerable range and depends on the peptone used. The introduction of lactose into the medium changes the optimum  $P_H$  value.

*A study of the activated sludge process:* J. A. WILSON, W. R. COPELAND AND H. M. HEISIG.

*Mineral composition of the water supply of seventy cities in the United States:* J. W. SALE AND W. W. SKINNER. The paper develops the fact that statistics showing the mineral composition of the water supplies of even the larger cities in the United States have not been compiled heretofore, although the matter is of considerable interest particularly to physicians and to the traveling public. Seventy analyses obtained from city officials have been reduced to a common basis for comparison and tabulated. Of the cities mentioned, Atlanta, Ga., has a water supply which contains the smallest amount of dissolved mineral matter, while Oklahoma City, Okla., has a water supply which contains the largest amount of dissolved mineral matter.

*Quantitative versus qualitative adjustment of the H-ion concentration of culture media:* GEO. C. BUNKER AND HENRY SCHUBER. The reactions of culture media prepared in the laboratories of waterworks are determined by one of the following three methods, of which the first two may be classed as loose and the third as approximate in reference to their precision. (1) By titration with phenolphthalein, (2) with phenol red or with brom thymol blue and (3) by comparison of a portion of the medium, to which a suitable indicator has been added, with color standards of definite H-ion concentration. The methods are discussed.

CHARLES L. PARSONS,  
Secretary